Test1 for PHYS 2130 section 091
Date: 7th Feb. 2007

Student First Name: Student Last Name:
Student Rocket ID:

You may use the backside of all pages. No calculators are allowed.

Questions 1: The sentence below may be completed by either of five alternatives. Write the letter corresponding to the alternative which is **impossible**.
A body can have (a) velocity east and acceleration east. (b) velocity east and acceleration west. (c) zero instantaneous velocity and non-zero instantaneous acceleration. (d) constant acceleration and changing velocity. (e) constant velocity and variable acceleration. (**1 point**)

Question 2: A golfing team must play on a putting green with an alligator pit. Figure 1 shows an overhead view of one putting challenge of the team; an xy coordinate system is superimposed. Team members must putt from the origin to the hole, which is at xy coordinates (8 m, 12 m), but they can putt the golf ball using only one or more of the following displacements, one or more times sequentially:

$\vec{d}_1 = (8\,\mathrm{m})\hat{i} + (6\,\mathrm{m})\hat{j}, \qquad \vec{d}_2 = (6\,\mathrm{m})\hat{j}, \qquad \vec{d}_3 = (8\,\mathrm{m})\hat{i}.$

The pit is at coordinates (8 m, 6 m). If a team member putts the ball into or through the pit, the member is automatically disqualified. What sequence of displacements should a team member use to avoid the pit? Write your answer in the table below as a sequence of any combination of displacements using only one symbol $\vec{d}_1$, $\vec{d}_2$, or $\vec{d}_3$ in each cell of the table. You may leave extra cells blank. (**1 point**)

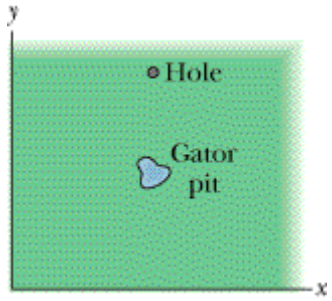

Fig. 1 Question 2.

Answer 2:

1st step	2nd step	3rd step	4th step	5th step	6th step	7th step	8th step	9th step	10th step

Question 3: Figure 2 shows an arrangement in which four disks are suspended at rest by massless cords. The longer, top cord loops over a frictionless pulley and is attached to a fixed wall. All four discs have the same mass. The tensions in the shorter cords are T_1, T_2, and T_3 as shown. What is the ratio T_2/T_3.? (1 **point**)

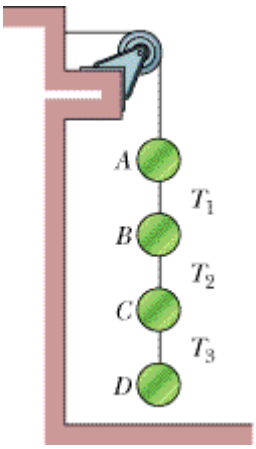

Fig. 2 Question 3

Question 4: A child is able to hold a toy car of mass m in contact with a vertical wall, at rest, by exerting a horizontal force of magnitude F on it. If the magnitude of the acceleration due to gravity is g, what is the minimum coefficient of static friction μ_s between the car and the wall? (**1 point**)

Question 5: Figure 3 shows a conical pendulum, in which the bob (the small object at the lower end of the cord) moves in a horizontal circle at constant speed. (The cord sweeps out a cone as the bob rotates.) The bob has a mass m, the string has length L and negligible mass, and the bob follows a circular path of radius r. The magnitude of the acceleration due to gravity is g. What is the tension T in the string? Your answer can only involve the known quantities, m, L, r, and g. (**2 points**)

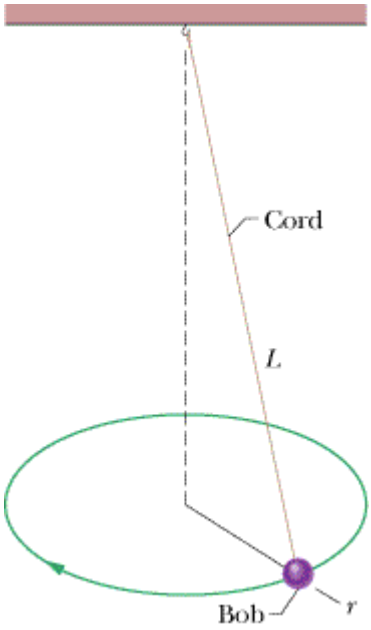

Fig. 3 Question 5

Question 6: A loaded penguin sled weighing W rests on a plane inclined at angle θ to the horizontal (Figure 4). Between the sled and the plane, the coefficient of kinetic friction is μ_k. Once upward motion has already begun what value of *F* is required to move the sled up the plane at constant velocity? Your answer can only involve the known quantities W, θ, and μ_k. (**2 points**)

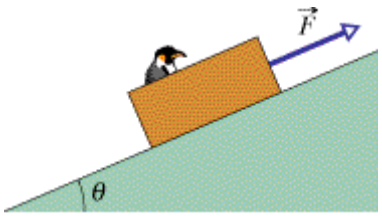

Fig. 4 Question 6

Question 7: You throw a ball at a speed of v_0 at an angle θ to the horizontal. Find the highest height h from its initial point of release, if the acceleration due to gravity is g. (**2 points**)